

## THE FIREFIGHTER AND THE COMPLEXITY OF HIS STRESSES IN THE FIELD

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### SHORT COMMUNICATION

**Abstract** The phenomena that accompany the activity of firefighters and another more specialized group, that of wildland firefighters, are complex and multifactorial, so that the stresses of their body are located in almost all organs and systems, but also interconnected, burdening their psychosocial background.

**Keywords:** Firefighters health and safety; musculoskeletal stress; wildland firefighters.

Undoubtedly, every year, we are going through an unprecedented outbreak of fires, under challenging climatic conditions, which affect all of us on a personal, living and social level. In the majority of cases, the reports of the days about the strain of people involved in firefighting, professionals and volunteers, concern their heat stress and the adversities of firefighting, in conditions of high temperatures and smoke, with all that this entails for their body.

Unfortunately, the phenomena that accompany the activity of firefighters and another more specialized group, that of wildland firefighters, are much more complex and multifactorial, so that the stresses of their body are located in almost all organs and systems, but also interconnected, burdening their psychosocial background. Thus, what in the field of Ergonomics and Occupational Safety we call "Human Factors" and concerns, among other things, the interaction of the environment and the components of work with the employee, in our case has a high correlation and affects superlatively, the final footprint of the stresses of the professional (and volunteer) firefighter.

Very interesting are the data recording problems that firefighters show in different phases of their service or training, as captured by NFPA's *Survey of Fire Departments for U.S* (<https://www.nfpa.org>). Thus, burn cases reach 8.5% at the site of fire, but surprisingly a 4.0% occurs during the training of firefighters. Smoke inhalation is expected to be high at the site of fires, at a rate of 5.9% of firefighters. Extreme temperatures in combination with smoke inhalation, can cause dehydration, destruction of respiratory tissues and organs, cramps and "restless legs" syndrome, etc. It is a typical case that the person chooses to use a cloth bandana to limit smoke inhalation. There, the pore size of the bandana is about 200X200 µm, which is 500 to 2000 times,

larger than the majority of elements found in smoke (0.100 to 0.400  $\mu\text{m}$ ). In short, the inhaled elements of smoke, gases and water vapor can pass the bandana like a mosquito through an open door, rendering it useless [1].

Injuries such as wounds, hemorrhages, bruises, etc. occur at high rates, over 20%, in all phases of response and firefighting, but also in emergencies outside fires, as well as during training. Impressive is the occurrence of cardiovascular events and strokes, during the response to the fire, at a rate of 2.1%, probably due to increased stress and sometimes on the basis of previous fatigue. In the recordings of cardiac events recorded by the National Interagency Fire Center U.S. (<https://www.nifc.gov>) and concerning the Wildland firefighters sector, from 1910 to 2020, the increasing trend appears with overwhelming percentages, in volunteer firefighters, from 1994 onwards, when they were officially included in the planning of firefighting teams. Almost all firefighters operating in a period of high demands, showed high levels of intra-hepatic lipids, during and after the end of the period, which is consistent with the tremendous metabolic changes that their body undergoes, in conditions of dehydration, poor nutrition and hormonal changes due to stress and fatigue [2].

The silent enemy of firefighters, however, is musculoskeletal problems and injuries, where rates are now skyrocketing throughout the process. We see a rate of 49%, mainly muscle injuries and ruptures, during the alarm and movement process in the incident, with corresponding percentages to 41% during firefighting, but also a very large percentage of 56% during urban emergencies (not fires). Impressive is also the percentage of 59%, almost 6 out of 10, during their training (mainly due to inexperience). These kinds of problems can be treated therapeutically immediately, but the timelessness of repeated loads on the musculoskeletal system can render the employee partially or significantly incapacitated.

Demands of excessive force, repetitiveness, the presence of vibrations, combined with uncomfortable and prolonged postures during firefighting or other interventions, strain the musculoskeletal system. In addition, the use of equipment and special tools and the protective clothing of the firefighter, burden him with many kilos, forcing him to respond under extreme temperature conditions, with all that this entails from energy expenditure and the appearance of fatigue. Fatigue, as a phenomenon, has a double dimension and occurs on the one hand in the body (periphery), if the muscles are tired and the stored energy is expended, but also at a central level, in the brain, where the cortical areas responsible for the functioning of our movement and our choices, are equally "tired" due to hyperactivity and lead us to the vicious circle of fatigue, physical, mental and mental. These phenomena have been recorded by firefighters, at work and are the number one factor of human error and work accidents, in the absence of attention and sluggishness.

An important role in preventing injuries in the field is played by training the technique of using tools, such as chainsaws and axes, used during deforestation in firebreaks and elsewhere where needed. The so-called "kicking" of the chainsaw, which occurs when its head is placed at the wrong angle in relation to the wood, results in high rates of injuries, sometimes serious, in almost all areas of the body, with main, arms, thighs, legs, and head. Similarly, it is necessary to train the technical use of the axe, since there are injuries, but also because the firefighter is forced to constantly change his posture during cutting, resulting in extreme load on his musculoskeletal system, with main areas of load, the waist and shoulders.

Firefighting procedures and other urban interventions require firefighters to always be prepared, respond quickly, think and react immediately, within time and always in dangerous conditions and situations. For the most effective intervention, but mainly for the safety of firefighters (professionals and volunteers), proper planning and planning of operations, good communication of crews and collaborating bodies, as well as proper working practices, resulting from proper training, are obviously required. The training should synthesize the technical elements of applications and interventions, with awareness and recognition of risks in different environments and thus teach professionals ways to adapt immediately to each scenario. Finally, nothing will have a long-lasting effect if the prevention of firefighters' stresses is not adopted, through their training in ways

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to improve their physical condition and musculoskeletal health, as well as psychological self-regulation techniques and social interactions.

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